LECTURES X AND XI

REPRINTED FROM

LECTURES

ON THE

PATHOLOGY AND TREATMENT

OF

LATERAL AND OTHER FORMS

OF

CURVATURE OF THE SPINE.

BY

WILLIAM ADAMS, F.R.C.S.

SURGEON TO THE ROYAL ORTHOPÆDIC AND GREAT NORTHERN HOSPITALS;
PRESIDENT OF THE HARVEIAN SOCIETY;
LATE LECTURER ON SURGERY AT THE GROSVENOR PLACE SCHOOL OF MEDICINE;
FORMERLY DEMONSTRATOR OF MORBID ANATOMY AT ST. THOMAS' HOSPITAL, &c.

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LECTURE X.

LATERAL CURVATURE OF THE SPINE.—CLASSIFICATION OF CASES.—PRINCIPLES, AND VARIOUS SYSTEMS OF TREATMENT.

CLASSIFICATION OF CASES.

In all books on lateral curvature of the spine you will find the cases arranged according to the different stages, or degrees of curvature, through which the several authors assume this affection to pass. Thus we find the external appearances and symptoms described of the first, second, and third degree of curvature, &c., it being, of course, assumed that a definite order of changes always occurs, and that the cases are essentially of the same nature. Even in books written by Orthopædic authorities on lateral curvature, who admit the existence of several forms of this affection, these are merely mentioned, and one form only described, viz., that which occurs in growing girls, and supposed to depend upon muscular and ligamentous debility associated with mechanical causes, such as standing on one leg, &c.

This may be called the popular form of lateral curvature, but, unfortunately, it appears to be generally assumed as the typical form of this affection, and the treatment recommended has always especial reference to this class of cases, so that we still have presented to us in books essentially one class of cases, and one method of treatment. This *one idea* leads to serious errors in practice; the treatment itself, whatever it may be, and however good as applied to a certain class of cases, is brought into disrepute by its failure, in many instances consequent upon its erroneous application, and from the pertinacity with which the advocates of the different systems each continue to adhere to one plan of treatment for all cases.

This unsatisfactory state of things can only be dispelled by a more extended investigation into the general pathology of lateral curvature, in reference to the constitutional as well as the local conditions under which it arises; and I have endeavoured to prove that these cases differ essentially in their general pathology—*i.e.*, as to the causes and mode of production; and that the indications for treatment, which can only be based upon a sound knowledge of the pathological anatomy, must, therefore, vary in the different classes of cases.

A careful observation of lateral curvature of the spine, during the last twelve years, in a large field of public practice, has convinced me that the arrangement and classification of these cases ought to be based, not so much upon any differences in the form, situation, and degree of curvature, as upon the relative extent to which the spinal affection can be traced to depend upon constitutional and local causes, with some reference also to the different periods of life at which the curvature may occur.

It is undoubtedly true that the immediate cause of lateral curvature is, as a general rule, purely mechanical; but the associated constitutional conditions are so variable and so important—acting as the most powerful predisposing causes—and so materially modify the indications for treatment, that these conditions appear to me to afford the best and most scientific basis for a general classification of these cases which, therefore, I propose to arrange in the three following classes, viz :—

1ST. CLASS. CASES ESSENTIALLY OF CONSTITUTIONAL ORIGIN, OR IN WHICH THE CONSTITUTIONAL LARGELY PREDOMINATE OVER THE LOCAL CAUSES.

These cases are often hereditary, occurring in two or three generations, and several members of the same family are frequently affected. They are generally associated with the strumous constitution in a marked degree, and may be arranged in two series or subdivisions, according to the period of life at which they occur, viz. : *a.* Those cases occurring in infancy or early childhood, *i.e.*, under three or four years of age ; and, *b.* Those which occur in children from seven to twelve years of age.

In the first series there is often no history of hereditary predisposition, and though a strumous diathesis may be feared, such is not clearly indicated ; the only apparent cause being *general muscular debility* which may have existed from birth, or have been induced by illness. The children are unable to support themselves in the sitting position, even when a year or a year-and-a-half old, and a lateral curvature of the spine is very readily produced if the nurse should always carry the child on one arm.

In the second series there is usually a history of *hereditary predisposition*, and the children in their general aspect are decidedly strumous. The deformity often increases rapidly, and becomes very severe. These cases are sometimes, but I believe erroneously, considered to depend upon rickets; the spine alone is affected, and there are no indications of rickets in the leg-bones or in the other bones of the skeleton; no enlargement of epiphyses; no pelvic deformity, or rachitic conformation of the skull.

There can be no doubt that constitutional causes largely predominate in the production of spinal curvature when this occurs in children under twelve years of age; and, according to my experience, these cases, from their natural tendency to terminate in severe and conspicuous deformity, are of a very unpromising character.

2ND CLASS. CASES DEPENDING UPON CONSTITUTIONAL AND LOCAL CAUSES IN ABOUT EQUAL DEGREES.

Hereditary tendency is not generally traceable in this class, but exists in some instances. The cases included in this class may be arranged in two subdivisions: *a*. *Cases depending upon induced constitutional or general debility, combined with local causes acting mechanically*; and *b*. *Those clearly of a rachitic character.*

a Lateral curvature of the spine, in the first series of cases, generally occurs between the ages of twelve and sixteen years in quickly-growing girls, not of robust appearance, but without any well-marked strumous diathesis or hereditary predisposition; though occasionally one or both of these conditions will be found to exist. This is the class of cases described by authors on lateral curvature, as depending upon muscular and ligamentous debility; and in this series are generally included that large class of cases which I have already stated may be more properly described as *weak spines*, and which certainly have no claims to be considered as examples of lateral curvature. There can be no doubt that weak spines frequently pass into, and become cases of, confirmed lateral curvature ; but according to my observation more than half the total number of cases of lateral curvature met with in practice are neither preceded, nor accompanied, by any such condition of general muscular debility.

The local causes which most frequently contribute to the production of lateral curvature of the spine in this class, are the *long continuance of certain bad positions*, which may be either acquired as bad habits ; or rendered necessary by a defective educational system, or certain occupations. As examples of the former, I would mention *standing on one leg*, which is frequently acquired as a mere habit by growing girls. This may produce curvature of the spine even in girls possessing the full natural amount of muscular strength, though it would do so more readily in those who exhibit some muscular debility.

The long continuance of the sitting and stooping position during education. I have frequently seen spinal curvature in young ladies who do not exhibit any want of muscular strength, but have been in the habit of sitting as much as eight hours a-day to masters at school, and also in girls who devote most of the day to drawing and writing.

The habit of sitting cross-legged which some young ladies adopt for several hours a-day whilst reading with a book placed on the knee, one elbow resting on the thigh and the head inclined forwards and resting upon the hand ; such a position must necessarily tilt the pelvis and curve the spine in the lumbar and lower dorsal regions, and if long continued in a growing girl, will infallibly produce curvature of the spine. A remarkable instance of curvature produced by this cause recently came under my observation, in a young lady, aged seventeen years, who measured five feet eight inches in height, and who had grown four inches a year for three years, according to the statement of her father, who had registered her growth during this period; nevertheless, she presented every appearance of good health, and possessed a full average amount of muscular strength. This habit of sitting cross-legged was evidently the immediate and essential cause of the spinal curvature; also *excessive horse exercise*, which in delicate girls sometimes leads to spinal curvature in the lumbar region. Another series of causes may be traced to

Certain Occupations which render the long continuance of some particular position necessary.—From this cause we frequently see spinal curvature both in boys and girls, and though in many instances associated with muscular debility, I have also frequently seen spinal curvature thus produced co-existing with the full amount of muscular strength. The occupations which most frequently produce spinal curvature in females are *needlework, envelope and book-folding, flower-making, ironing, nursing children, carrying heavy weights*, &c.

Although the local causes above enumerated, may be in some instances, of themselves sufficient to produce lateral curvature; still, they more frequently contribute to this result when co-existing with constitutional or induced general debility, perhaps consequent upon an attack of fever or some other illness. Essentially, therefore, in the class of cases we are now considering, and which generally occur in growing girls between the ages of twelve and sixteen years, constitutional and local causes combine in about equal proportions to produce the spinal curvature.

b. The second series essentially includes cases of lateral curvature clearly of a rachitic character, i.e., associated with the general rachitic conformation of the skeleton, and the curvatures of the long bones of both the upper and lower extremities invariably occurring in this affection; more especially I allude to the dwarfishness of stature and general arrest of development of the bones, most conspicuous in the legs and pelvis; the curvatures of the leg-bones, and to a less extent of the bones of the upper extremities, with the enlarged epiphyses; the deformity of the pelvis; and the general conformation of the skull, &c.*

This rachitic condition is very seldom hereditary, and I believe is generally dependent upon imperfect lactation. The worst cases which have come under my observation have occurred either in the children of healthy parents, or of somewhat delicate but not rachitic parents; and generally only one child is thus affected in a family, the other children being perfectly healthy; occasionally I have seen two or three cases in the same family, and in a few instances all the children in the same family are more or less affected. In every instance, however, imperfect lactation has been clearly traceable, the mother's milk being either insufficient in quantity or poor in quality; and the children have generally been half suckled and half fed, the food being of a farinaceous kind, such as *tops and bottoms*, various kinds of biscuits, &c., all of which are unsuited to the requirements of the child during its period of early growth and rapid osseous development. I believe rickets therefore to be an induced, and not an hereditary constitutional condition.

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* For an account of the peculiarities of the rickety skeleton and their explanation, see a very able paper by Mr. Alexander Shaw in the *Transactions* of the Medico-Chirurgical Society, Vol. XVII, 1832, London.

Lateral curvature of the spine in these cases very rarely occurs at an early period, so far as my experience has gone. I have never seen rickety curvature of the spine in very young children, and in several cases of rickets in its worst forms in children from four to twelve years of age, now under my care, the spines are still free from lateral deviation, though the older cases exhibit rather severe lordosis ; yet in nearly all the rickety adult specimens in museums, severe lateral curvature forms a conspicuous part of the general deformity.

I conclude, therefore, that in cases of rickets, the lateral deviation of the spine usually takes place towards the completion of growth, and continues gradually to increase long after that period, perhaps, even through life. The cause of the lateral curvature appears essentially to depend upon the equilibrium of the spine having been for a long time disturbed, either by the deformity of the legs, the curvature in which frequently render them of unequal lengths, or by distortion of the pelvis.

I do not deny that lateral curvature of the spine may sometimes be seen in cases of general rachitis, at an earlier period, than twelve years of age ; but such cases I believe to be exceptional, and their explanation may always be found in one leg being more deformed and shorter than the other, so that confirmed tilting of the pelvis has been produced.

As a general rule, the opinion that lateral curvature of the spine occurs at a late period, in cases of rickets, will, I believe, be found to be correct. This statement, I am aware, is directly at variance with that of some authorities who consider that the curvature in these cases generally commences under five or six years of age. The explanation of this discrepancy probably is that a very different class of cases from those which I have described as belonging to the rachitic series, are included by the authors alluded to in the rachitic class of distortions, viz., such cases as I have arranged in the first class, generally depending upon hereditary tendency to curvature, associated with a strumous constitutional condition.

I regard the lateral curvature of the spine, therefore, in the rachitic cases as depending upon induced constitutional and local causes in about equal degrees; but the local are probably of more importance than the constitutional.

In children affected by rickets, the vertebræ are said to be softer than in healthy children; and the general statement is, that in these cases the bones become much more altered in shape than in the other forms of curvature; but this does not appear to be confirmed by an examination of the rickety skeletons in museums. In St. Thomas's, the College of Surgeons, and other museums, are numerous specimens of severe lateral curvature, consisting of the spinal column, with the pelvis attached; and in those specimens in which the pelvis has attained its normal size, and is free from deformity (mostly examples of the cases just described in Class I), and which we are justified, on this account, in excluding from the class of rickety distortions,* the vertebræ are seen to be, in many instances, more altered in shape than in the specimens of true rachitic curvature, associated with pelvic and other distortions.

It must be especially borne in mind that it is only in the class of true rachitic curvatures that any distortion of the pelvis takes place, and, therefore, it is only in these cases that any risk to life exists from pregnancy. The importance of clearly defining these cases, and the evidence upon which our opinion should be based in deciding upon the true rachitic character of any case of lateral curvature of the spine, has been already adverted to in Lecture V, in connexion with the question of special liability to lateral curvature, in consequence of the affection of the bones in rachitic cases; and also in connexion with the question of pelvic deformity, and its influence on child-bearing.

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* See observations on this point, by Mr. John Shaw; and also by Mr. Alexander Shaw, above referred to,

3RD. CLASS.—CASES ESSENTIALLY DEPENDING UPON LOCAL CAUSES ACTING MECHANICALLY SO AS TO DISTURB THE EQUILIBRIUM OF THE SPINAL COLUMN.

Lateral curvature in these cases may occur at any period of life, though most apt to form in a severe degree previous to the completion of growth. The cases which I propose to include in this class are essentially unconnected with any constitutional affection, or hereditary predisposition, and frequently co-exist with the full natural amount of muscular strength. My late colleague, Mr. Lonsdale, observed "the common lateral curvature occurs most frequently in young women, who, though comparatively of a delicate constitution, do not as a rule, offer any mark of disease; while there are a very large number who are really fine healthy young women."*

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* "Analysis of 3000 Cases of Deformities, with Remarks," by E. F. Lonsdale, published in the *Lancet,* September 1, and September 8, 1855.

Further inquiry, however, into the history of these cases, will generally reveal the existence of some local cause which of itself has been sufficient to produce the curvature.

From ironing and also from nursing children I have seen spinal curvature produced in girls of an unusually muscular and robust appearance, and in such instances many would contend that the excessive use of the right arm was the essential cause, but I believe the position alone with its necessary result of irregular distribution of weight, to be a much more powerful and direct cause of the spinal curvature.

As examples of spinal curvature produced by certain occupations in boys exhibiting great muscular strength, I would refer to the case of a boy who had long been in the habit of carrying heavy goods up a spiral staircase with a low ceiling at a pawnbroker's shop. This was a stout, muscular, and vigorous boy, but a severe lateral curvature, as shown in the cast exhibited, was produced by his occupation. Also a healthy, muscular boy under my care, who had been two or three years at a gold-lace factory, and was accustomed to wind the lace, which obliged him to stoop sideways. In addition to the habits and occupations above referred to, I would also mention

Inequality in the Length of the Legs, from any Cause.—By many writers on spinal curvature, especially those of the mechanical school, who undertake to prove mathematically that certain results must necessarily follow from any given mechanical deviations, inequality in the length of the legs has been greatly exaggerated as a cause of spinal curvature; but in contradiction of these mathematical sequences, cases may often be seen in which inequality in the length of the legs has existed for many years, without producing spinal curvature. The fact is, it does not always do so when associated with the full amount of muscular strength. Many patients who have recovered from hip-joint disease with some contraction of the limb, or who walk lame from contracted knee-joint after disease, appear to have curvature of the spine when walking or standing; but when examined lying down, or whilst standing with a book under the short leg, sufficient to bring the hip-joints to a level, it will be seen that little or no permanent spinal curvature has been produced. The muscular power and active motion appear to prevent spinal curvature in many of these cases.

In cases of *inequality in the length of the legs from muscular paralysis and imperfect development of one limb,* lateral curvature of the spine in the lumbar region is always produced, but even in these cases it is not often of a severe form.

Inequality in the length of the legs from congenital dislocation of one hip-joint, also certainly produces lateral curvature, but many years are required to bring about this result, and even then it is much less than the mathematical authorities would lead you to expect it must necessarily be.

The same may be said of the cases of *congenital shortening of one leg.* About seven or eight years ago a child was brought to me with congenital shortening of one leg, depending upon deficiency in the length of the tibia and fibula to the extent of about an inch and a-half; the foot was in the position of valgus and the outer malleolus indistinct; I suspected the tibia and fibula were fused at their lower extremities, and that the outer malleolus was either deficient or very imperfectly formed. The leg below knee in this girl is now four inches shorter than the opposite leg; but she is strong and muscular, and very little curvature of the spine has been produced; she wears a high boot with steel supports to the calf of the leg and straps to keep the foot in a straight position. Dr. Little completely rejects inequality in the length of the lower extremities, as one of the causes certain to produce spinal curvature, and observes:—"I have examined no case in which, notwithstanding the shortening, other causes of lateral curvature did not exist. On the contrary, it is very remarkable, according to my experience, that difference in the length of the lower extremities is so rarely accompanied with deformity of the spine."*

The effect of a wooden leg in producing spinal curvature has also, I believe, been greatly exaggerated. Although by some authorities it has been attempted to prove mathematically that spinal curvature must result from this cause, I have examined several young men who have worn a wooden leg for five or six years without any spinal curvature being produced; nevertheless, a slight spinal curvature is sometimes seen in these cases.

Amongst the causes which act mechanically so as to disturb the equilibrium of the spinal column, though not themselves of mechanical origin, I would enumerate *diseases of the chest*, such as empyema, which, after the evacuation of the pus and the permanent shrinking and collapsing of the lung, produces a most severe form of lateral curvature, not, I believe, by the tonic contraction and structural shortening of the muscles on the affected side, as has been explained by Dr. Little,† but in consequence of the position assumed by the patient, in part from the pain suffered, and in part to favour the increased respiratory action carried on by the healthy lung on the opposite side. Although a very marked loss of balance of muscular power exists in these cases, I believe position, which is only in part dependent upon this disturbed muscular balance, to be the more powerful and more immediate cause of the spinal curvature.

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* "Little on Deformities," page 363.

† *Op. cit.*, page 362.

Other diseases of the thoracic and abdominal organs, such as tumours, &c., might be enumerated in the same category, which would also include the cases of lateral deviation, not often severe, which result as consecutive curvatures in cases of caries of the spine after angular projection has taken place, and may occur either above or below the angular curvature.

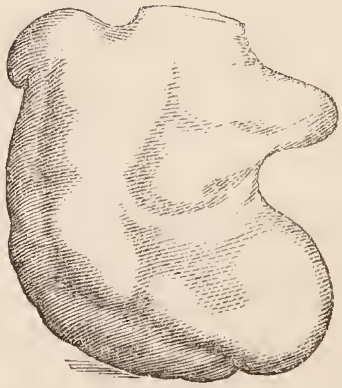
I have now enumerated the local causes which most frequently produce lateral curvature of the spine, essentially unconnected with any constitutional disorder, or hereditary predisposition to this affection. The importance to be attached to the disturbed balance of muscular power —undoubtedly existing in many of these cases—as an active cause in the production of the deformity, will be differently valued by those who study these affections, according to the leaning they may have towards the different theories of the production of lateral curvature in its more ordinary forms; but according to the physiological views, which I have explained in the second lecture, I am induced to attach a higher degree of importance to the mechanical effect of the long continuance of certain positions in the production of which, the muscles are often entirely passive.

When, in many positions assumed by healthy, muscular people, certain muscles are called powerfully into action, the muscular force seems to be exerted rather to prevent or limit the curvature, than to produce or increase it, the muscles in the concavity of the curves, remaining soft and inactive, whilst those on the convexity are tense and prominent.

The classification of cases of lateral curvature of the spine which I have now described as based upon the relative degrees in which the constitutional and local causes contribute to the production of curvature, may not be considered as including a very rare form of lateral curvature, viz.: that depending upon *congenital malformation of the spine.* I have not had the opportunity of dissecting or examining any specimen belonging to this class; but malformation, depending either upon excess or deficiency, of the bodies of the vertebræ, the lateral halves of which are unequally developed, has been met with. A very remarkable example of this kind exists in the Pathological Museum at Vienna, and has been described by Rokitansky.*

A case probably belonging to this class was recently admitted into the Orthopædic Hospital under my care. The patient was a child aged two years, and severe lateral curvature of the spine, involving the whole of the dorsal and lumbar vertebræ existed, the convexity of the curve being towards the left side, as shown in Fig. 41. The pelvis was also tilted to a remarkable extent, and seemed to depend upon some obscure malformation of the lumbar vertebræ, probably involving the sacrum. The distortion was said by the parents to have been congenital. I endeavoured to apply a mechanical support, with the view of preventing in-

FIG. 41.



Case of congenital curvature of the spine, with tilting of the pelvis in a child, aged 2 years.

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* "A Manual of Pathological Anatomy," Sydenham Society's Edition, Vol. III, page 228, 1850.

crease of distortion, but the difficulties were so great as to give little hope even of this being affected.

There is also in the museum of the hospital a cast from a very similar case.

In such cases of congenital malformation, the curvature will certainly increase when the child is able to assume the sitting position, and distortion will proceed when it begins to stand and walk, the mechanical condition of irregular distribution of the weight of the head and upper extremities then coming actively into play.

PRINCIPLES; AND VARIOUS SYSTEMS OF TREATMENT.

The treatment of lateral curvature of the spine, if conducted in accordance with the views of the general pathology of this affection, which I have endeavoured to establish in these Lectures, must be both constitutional and local in nearly all the cases which occur during childhood and youth. In some few instances in young people the spinal curvature will be found to depend almost entirely upon local causes acting mechanically, as described in Class 3, and in such cases the treatment will be esentially local. In the cases of lateral curvature also requiring treatment at the more advanced periods of life, say from thirty to fifty years of age, or even later, the treatment will be purely local, the object being not to cure but to check and arrest the increase of the spinal curvature.

With few exceptions, these are cases in which the spinal curvature, neglected or badly treated during the period of growth, when alone a cure can be anticipated, has increased under circumstances of failing health, or in consequence of its own mechanical conditions, such as the disproportionate length of the dorsal to the lumbar curve, or *vice versa.* But in all other cases the constitutional conditions upon which I have laid so much stress as a causative influence in the production of lateral curvature, will demand a large share of attention, and the treatment of the spinal affection will be successful in proportion as the constitutional and local means are judiciously combined.

The constitutional conditions under which lateral curvature of the spine is found to occur have been already described, but may be again enumerated as

1st. *General debility* which sometimes exists from birth, and favours the production of spinal curvature even in infants from six months to two or three years of age: and in other cases may be induced by febrile and other affections, when it exerts a similar influence during the period of youth and active growth, often leading to the production of spinal curvature in girls, from twelve to sixteen years of age.

2nd. *An hereditary predisposition* to spinal curvature, frequently co-existing with a *consumptive tendency,* a combination of causative influences which we meet with in cases of lateral curvature occurring in girls from seven to twelve years of age, and sometimes later; in such cases the curvature has a marked tendency to increase rapidly, and terminate in conspicuous deformity.

I believe it to be the opinion of those physicians whose experience is the largest in consumptive cases, that lateral curvature of the spine very rarely co-exists with tubercular disease,—an opinion which would seem to prove that the tubercular diathesis does not favour the production of spinal curvature in any marked degree. The frequency of consumption in the male as well as the female sex, and the infrequency with which lateral curvature occurs in the male sex would also favour this opinion; unless we regard the physical influences under which the two sexes are placed as sufficient to explain this difference, a conclusion which, I think, can hardly be granted to the full extent required by the argument.

An hereditary predisposition to lateral curvature, is without doubt the condition which can generally be traced, and to which I believe the first importance must be attached; but, co-existing with this condition, we have also very frequently a family history of consumption, —one of the parents, or, as in many cases which have come under my observation, several members of the family, having died of consumption—and in several cases of spinal curvature belonging to this class I have known the patient also die of consumption.

We may, however, often be misled as to the consumptive tendency, if we rely upon the general aspect and appearance of the patient, when this may seem to favour such an opinion, and may even be combined with a family history of consumption. In many such cases which have been under my care, generally in young ladies, when the increase of the spinal curvature has been arrested by mechanical support, combined with constitutional treatment, the patients have been restored to a good state of health, and remained so after the lapse of many years, so that the symptoms which excited so much alarm must be regarded as having depended largely upon the spinal curvature.

When the constitutional conditions which I have described exist either singly or in combination, they must greatly influence our views as to the course to be adopted, and be regarded as sufficient to negative some methods of treatment such as complete recumbency, by which I mean *lying down for one or two years*, which would only more completely exhaust the constitutional powers of the patient; and also *gymnastics*, when employed as a system of strong muscular exercises, which only fatigue the patient without improving the spinal curvature.

A combination of lying-down to the extent of four or six hours a-day, together with light gymnastic exercises, is the treatment best adapted to such cases at the commencement of the spinal affection, when curvature is threatened rather than positively formed; but if curvature has actually taken place, then mechanical support must be combined with the partial recumbency and light gymnastic exercises.

THE CONSTITUTIONAL TREATMENT in these cases must be regarded as at least of equal importance with the local treatment, and every effort made to improve the general powers of the patient. For this purpose, I have found the free exhibition of the hypophosphite of lime, and preparations of iron the most useful. Generally I direct five grains of the lime to be dissolved in a wineglassful of water, to which ten drops of the Træ. ferri sesquichlor. may be added, and taken twice a-day, at, or directly after, meal times. In addition, also, I give half-an-ounce of cod-liver oil, to be taken twice a-day, an hour after meal times, and recommend the use of wine or beer, as the patient may prefer.

The influence of soil and place of residence is also of the greatest importance, and, I advise the removal from large towns, damp situations, and clay soils, to high and dry situations, on a chalk soil. The great improvement in the general health and strength of delicate children, and growing girls with spinal curvature, which I have seen follow a change of residence from such counties as Lincolnshire, Cornwall, Devonshire, &c., to high and dry situations on chalk hills or downs, has led me to recommend such a change of residence in these cases where practicable. To these measures we may also add the use of the cold bath, where it can be borne, followed by frictions to the back, and free out-door exercise.

THE LOCAL TREATMENT of lateral curvature of the spine is that to which the attention of the Profession has been generally—I might almost say exclusively—directed; and at different periods, various methods, or so-called *systems of treatment*, have sprung into existence, through the advocacy of those who have specially devoted their attention to the treatment of this class of affections; and each *system* in its turn has more or less completely enjoyed the support of public opinion, and the sanction of the Profession.

I have already enumerated, in the first Lecture, the most important of these systems, or those which have received the greatest weight of authority; and will now again advert to them in reference to the anatomical and pathological principles upon which they are based, and examine how far these are compatible with the views which I have brought forward in these Lectures, in reference to the anatomical construction and mechanism of motion of the spinal column, and the pathological conditions which, I believe, will be found to exist in every case of lateral curvature, however slight. We have, then:—

1st. The system of *complete recumbency.*

2nd. The system of *muscular exercise, or gymnastics.*

3rd. The system of *cutting the spinal muscles.*

4th. The system of *mechanical extension.*

5th. The system of *mechanical treatment by support and pressure,* applied by means of spinal instruments.

All these different systems are reported to have been in every way successful, and satisfactory in effecting the cure of lateral curvature of the spine; and the perusal of the various works or treatises in which these systems have been advocated, serves only to impress one with the conviction that lateral curvature of the spine has even at the the present time, no fixed pathology; and therefore no fixed principles of treatment have as yet been determined.

1st. THE SYSTEM OF COMPLETE RECUMBENCY, by which patients used to be condemned to constant lying down for at least one or two years, and frequently for a much longer period, has had many advocates in this country; but its injurious effects upon the general health, as well as its complete failure to cure the spinal curvature, except in its slightest forms, has led to its discontinuance as a system. Its admitted disadvantages have been so loudly proclaimed by the advocates of other systems, and more especially by those who profess to cure lateral curvature by gymnastics, as well as by those who assert the curability of spinal curvature, even in severe cases, by means of spinal instruments, that the advantages which undoubtedly belong to recumbency, when judiciously employed, and combined with other means, have been of late years to a great extent lost to the public; and the treatment of spinal curvature has been proportionably less successful than it would have been, if the views taken of its pathology and treatment had been based upon more accurate observation.

The great object of recumbency is to relieve the spine from the superincumbent weight of the head and upper extremities, which it is obviously unable to support when curved, or even disposed to curvature; and as the immediate cause of curvature of the spine is undoubtedly mechanical in its nature and action, viz., the irregular distribution of the weight of the head and upper extremities, the immediate object is most completely effected by the patient assuming the recumbent position.

All the mechanical conditions upon which lateral curvature so much depends are thus removed, and the patient, during recumbency, relies upon her constitutional strength and powers of development and growth. These are, in many instances, sufficient, during the period of youth, to lead to the complete reparation of such structural damage as the intervertebral cartilages and oblique articulating processes may have sustained when the curvature is slight and of recent formation.

I regard lying down, therefore, during the period of active growth, as essentially *a curative means* in cases of spinal curvature; and whilst I reject it, as *a system* to be relied upon exclusively in any class of cases, I recommend its adoption in every case during the period of growth, in conjunction with such other means as may be thought advisable; in some instances with gymnastic exercises, and in others with mechanical support; occasionally also in conjunction with both these methods of treatment.

I would here observe that there is no greater error than to suppose that these different methods or so-called systems of treatment, are essentially incompatible with each other; their objects, it is true, are very different, yet both theory and practice teach us that in many instances they may be most advantageously combined for the benefit of the patient.

As a general rule, I advise recumbency in proportion as the spinal curvature predominates in the lumbar region, in which situation it must be admitted that mechanical support can be of little use; here there are no ribs against which pressure can be exerted, and no one will contend that the transverse processes of the lumbar vertebræ are adapted to receive mechanical pressure, which through them can be beneficially exerted upon the lumbar vertebræ.

With regard to the extent to which I recommend lying down, I would observe that in ordinary cases I advise recumbency at least during four or six hours a-day; and this can be borne with comfort and without any disadvantage to the general health, if the patient use the reclining chair represented in Fig. 48.

2nd. THE SYSTEM OF MUSCULAR EXERCISES, OR GYMNASTICS, as a curative means in the treatment of lateral curvature of the spine, has been relied upon with more confidence by Continental than English Surgeons; and according to the statements made by the leading Professors of this system, lateral curvature is certainly cured when the deviation is slight, and as certainly arrested when more severe; hence it is assumed to be at least equal, if not superior, to other methods of treatment.

The pathological idea upon which this system is based is that lateral curvature essentially depends upon muscular debility, and the argument therefore is—if muscular debility be the cause, will it not be desirable to strengthen the muscles by means of a proper system of gymnastic exercises? rather than apply mechanical support, which must, by superseding the necessity for muscular effort, tend to weaken the muscles to a corresponding extent; or than to adopt a system of lying down, which would still further debilitate both the system and the spinal muscles.

The argument is logical and attractive enough both to the public and the Profession, who generally adopt the muscular debility theory of the production of lateral curvature; but there can be no doubt that this hypothesis can only apply to a limited number of cases. I have already stated that certainly less than half of all the cases of lateral curvature which have passed under my observation, have been neither preceded nor accompanied by any muscular debility; and that even where muscular debility has existed, other causes, both constitutional and local, have also existed, and according to the views of the mode of production and general pathology of lateral curvature which I have adopted, appear to me to be of not less importance than the condition of muscular debility.

Let it be admitted, however, that in many cases an increase of muscular strength is desirable, and the question which naturally follows is, can this be so obtained as directly to cure, or to contribute to the cure of lateral curvature of the spine?

If in any case of lateral curvature, all the muscles of the spine could be at once raised to their maximum of power, the only effect would possibly be to arrest the curvature at that point; cases of moderate severity frequently undergo spontaneous arrest where the general health and muscular power are improved, though I I believe this only occurs when the mechanical conditions of the curvature—more especially the equality in length of the dorsal and lumbar curves—are favourable to such a result; but in such cases no advance is made towards straightening the crooked spine, which must be considered the main object of treatment.

A general increase of muscular strength being thus considered useless as a curative means, it may be asked, cannot we by special muscular exercises develop only the muscles which would tend to correct the spinal curvature?

By the gymnastic professors it will doubtless be contended that we can; but I have no confidence in the curative effects of any system of special muscular exercises, whereby the muscles on one side of the spine are sought to be particularly developed.

I believe such a result to be practically impossible for two reasons, 1st: The anatomical difficulty, arising from the number and complex arrangement of the spinal muscles, of stating precisely in any given case, the exact muscles and portions of muscles, the increased power of which would act beneficially on the curvature; and 2nd. the impossibility of strengthening these particular muscles and portions of muscles, if they could be selected, without at the same time strengthening other muscles the increased action of which would at least neutralize their effect.

Another, and I believe a fatal objection to the pretentions of the muscular exercise, or gymnastic system, is, that it rests upon the idea of free motion or surface-play being allowed at the articulations of the vertebræ, and an absence of structural changes in the articular surfaces; in fact upon the idea of the anatomical analogy between the articulations of the vertebræ, and the movable articulations of the extremities, and consequently upon the idea of an analogy in the pathological conditions attending the distortion of the spine and those of the limbs.

I have, however, endeavoured to prove that there is a complete absence of any analogy between the vertebral articulations and the movable articulations of the extremities; and that no curvature, however slight, can exist without structural changes affecting the intervertebral cartilages, and the oblique articulating processes, in a degree proportionate to the curvature. Now, it cannot, I imagine, be maintained by any one who has studied the nature of these structural changes, that they can be removed by any system of gymnastic or muscular exercises.

The muscular exercise, or gymnastic system, must therefore be rejected as a system capable of curing lateral curvature of the spine; but nevertheless, when used judiciously, and in conjunction with other means, in cases of slight lateral curvature associated with muscular debility, there can be no doubt of the great value of a well regulated system of gymnastic exercises.

In cases of *weak spine* which threaten to pass into actual curvature, cases which I sometimes speak of as *threatened curvature,* occurring in girls from twelve to sixteen years of age, gymnastic exercises are invaluable; and in conjunction with the use of the reclining chair for about four hours a-day, may be confidently relied upon as the best *preventive* means at our command, the general health at the same time being improved by such constitutional means as may appear to be indicated. In cases of slight curvature also, I employ gymnastics in combination with partial recumbency, and mechanical support by the lightest form of spinal instrument, such as the Eagland belt; and now from long experience I am enabled to state, that this combination of means contributes to a favourable termination, much more certainly than the employment of either system alone.

The gymnastic exercises which appear to me to be the best adapted for strengthening the spinal muscles equally on both sides, are those used by means of the *hand-swing, the elastic chest-expander, and the act of drawing up a weight from the ground,* which may be imitated by a short and strong cord of vulcanised India-rubber attached to the ground, as represented in Fig. 50. This is the movement of the *top-sawyer* at the saw-pit. More varied exercises may also be employed, but essentially these appear to me to be the most useful for children. For girls and boys a little older, however, the more powerful exercises shown in Figs. 53 to 57, may be recommended.

3rd. THE SYSTEM OF CUTTING THE SPINAL MUSCLES. In direct opposition to the idea of muscular debility and the treatment by gymnastic exercises, we have the theory of M. Guérin, that lateral curvature of the spine is produced by the active or tonic contraction of some of the spinal muscles, in the same way that club-foot, wry-neck, and various contractions of the limbs are known to be frequently caused; and upon this pathological idea M. Guérin has recommended, and for many years extensively adopted, the practice of dividing the spinal muscles. The operation, however, has found but few advocates in France, and still fewer in England.

I have already discussed at some length, and I hope have succeeded in showing the fallacies upon which this theory is based. It is unnecessary, therefore, for me to say more in reference to the practice arising out of it, viz.,—the section of the spinal muscles,—than that I entirely disapprove of the operation, and regard it essentially as an unsound and unscientific procedure; and that I do not believe there are any cases of lateral curvature in which such an operation can ever be called for.

Amongst those who have strongly opposed this operation may be mentioned Mr Bishop, who in his well-known work on Deformities* makes the following observations. "In Memoirs read before the Académie Royal de Médecine de Paris, M. Guérin stated . . . . . that he had obtained the most satisfactory results from dividing the sacro-lumbalis and longissimus dorsi muscles in curvatures of the spine. In order to ascertain the truth of these statements, Malgaigne investigated the condition of the patients placed under M. Guérin's treatment; and in a memorial addressed to the Academy* reported that, of the twenty-four cases described as convalescent, he could not find one that was permanently cured; that others, instead of being improved by the operation, were decidedly injured; and he detailed the cases in which this had occurred. This provoked a discussion in the Academy, of a violent and acrimonious character, and a commission was appointed to investigate the matter. The surgeons who were charged with this inquiry reported that the statements of Malgaigne were very exact, that M. Guérin had not succeeded in completely curing curvatures of the spine, and that spinal myotomy would prove a useless, if not a dangerous method of treatment. They stated, moreover, that they had never witnessed any good effects from dorsal myotomy.

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* "On the Pathology and Treatment of Deformities," page 57. by J. Bishop, 1852.

"Malgaigne and Bouvier† contend that not only is the division of the sacro-lumbalis and longissimus dorsi muscles not attended with any advantages, but the latter, on the contrary, maintained, very rationally, that the muscles in question are constantly required for the movements of the trunk, and that there is no advantage to be gained by their section which cannot be obtained by other means."

4th. THE SYSTEM OF MECHANICAL EXTENSION. The idea of straightening a crooked spine by the process of stretching it, is of ancient date; the system of mechanical extension, employed both in the erect and the recumbent positions, has been very generally adopted throughout the

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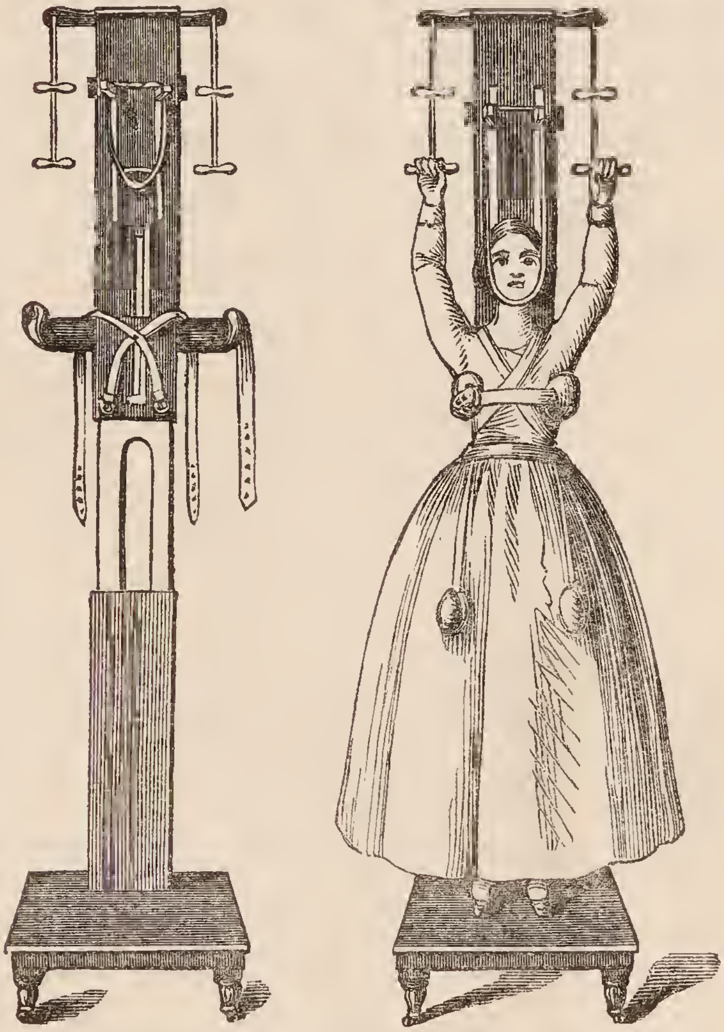
* Mémoire sur la valeur réelle de l'Orthopédie, et spécialement de la Myotomie rachitionne dans le traitement des déviations latérales de l'épine, par M. Malgaigne. Comptes Rendus, Tome XII, Avril 15, 1844.

† Archiv. Gén. de Méd, Août, 4, 1843.

Continent, and is still in vogue to some extent. In England, also, the practice was in favour twenty years ago, but never so generally adopted as in France and Germany.

Mr. Stafford advocated the plan of extension in the erect position in severe cases, and from his work the drawing of the apparatus employed, see Fig. 42 is copied.

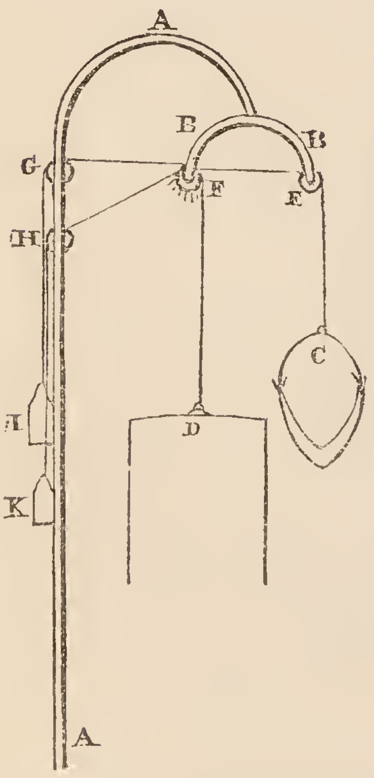
FIG. 42.



Apparatus for stretching the spine in the erect position called the "spine elongator," invented by Mr. Stafford.

In reference to this apparatus Mr. Stafford observes, "Lateral exercise, however, will not always recover a lateral curvature. The spine is sometimes so completely distorted, and the vertebral column so entirely thrown out of the centre of gravity, that the muscles have lost their power. They are so stretched on the convex, and so contracted on the concave side of the curve, that they cannot act. In such cases lateral exercise will not alone be sufficient. More must be done. The spine itself must be elongated; and the best method of accomplishing this is by the gravitation of the body. To effect this object I have invented a machine by which the patient can be raised up from the ground by the upper part of the body, while the lower part hangs suspended. Hence, the lower part, by its own gravitation, and by additional weights being hung round the hips, gradually elongates the spinal column until it becomes nearly, if not quite, for the time being, straight. In this manner the muscles and ligaments of the vertebræ are stretched. The muscles on the concave side are lengthened; whilst those on the convex are shortened, and allowed to contract, whereby they are both put into a more favourable position to pull back and retain the vertebræ in their situation."*

FIG. 43.



AA is a steel rod, the upper part being in form of an arch; it is to be fixed into a brass socket, on an upright piece of wood attached to the back of a chair. To the arch, the semicircle BB is rivetted; and at the extremities of BB the pullies EF are fixed. In the rod AA the pullies GH are placed; and to the head piece C and shoulder piece D, cords with weights are fastened.

Mr. John Shaw approved of the plan of extension, only to a limited degree, and in conjunction with muscular exercises, shampooing, and partial recumbency; and then adopted the plan of extension in the horizontal position, using the exercising plane represented in Fig. 52, with some additions, see p. 340 of his work previously referred to. "But," he observes, "as the discipline is rather severe, we should contrive means to enable the patient to sit up occasionally. This is easily done, and without any risk of losing what has been gained by the exercises and rest. . . . . . . I have lately used the apparatus sketched below; it appears complicated, but is in fact very simple."

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* "Two Essays on Diseases of the Spine," R. A. Stafford, London, 1844, page 76.

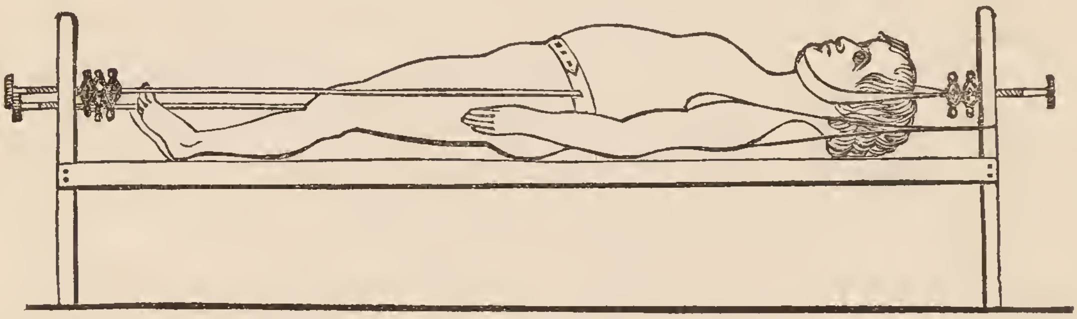
The idea with which Mr. Shaw used this apparatus was not so much that of making active extension, as of maintaining the advantage gained by extension in the horizontal position, whilst the patient by the aid of the crane, with weights and pullies attached, was enabled to assume the sitting position, and as he states "could write, draw, or practice at the piano-forte."

A contrivance somewhat resembling the above has, however, been used with a very opposite view, active extension being relied upon as a means of cure; and not long since I saw, in a private establishment for the treatment of deformities, near Portman Square, a sort of hanging contrivance by which patients were drawn up by the head off the ground, and allowed to remain suspended in the air for a certain time.

The method of extension in the horizontal position is now seldom, if ever, used in England; but in the private Institution just referred to, I saw several extension couches divided transversely in the centre, so that the two halves could be separated by machinery when the patient was fixed on to it by straps, &c.; the head and upper extremities being fixed to one half, and the legs to the other. I was informed, however, that neither the crane above referred to, nor the extension couches, were now used in the treatment at present adopted in that establishment, the system now employed being essentially gymnastic.

The principle upon which the extension couches act to stretch the spine, with the patient in the horizontal position, is one which has been in former times adopted by a great variety of contrivances, representations of which are to be found in various works. Mr. John Shaw, when alluding to the different machines which have been invented for the purpose of stretching the spine, gives

FIG. 44.



Apparatus for stretching the spine in the horizontal position, used in Paris, at the Orthopédique in the year 1825. Copied from John Shaw, p. 67.

a representation of that drawn in Fig. 44, and observes "The wood-cut above represents the latest invention of this kind. In is used in Paris in an Institution called the Orthopédique," date 1825.

Mr. Shaw objects to this and other contrivances which keep the spine stretched, without at the same time exercising the muscles. And speaking of the above apparatus remarks, "I have already had an opportunity of knowing that the plan has failed, even under the superintendence of the inventors; and it will not now be denied that the confinement must be injurious."

I have thus alluded to some of the various methods of extension, as matters rather of historical interest than practical importance at the present time.

A more intimate knowledge of the series of adapted structural changes which, as I have shown in the preceding lectures, take place in all cases of confirmed lateral curvature, lead to the conviction that no practical good can result from the system of mechanical extension, either in the erect or recumbent position.

5th. The system of mechanical treatment by means of spinal instruments. The idea of straightening a curved spine by means of mechanical contrivances, described as portable instruments, fixed on the body, and constantly worn by the patient, without the necessity of lying down, is of modern date, and may be described as the English orthopædic treatment of the present day. These instruments are believed by some to act upon the same principle as we now adopt in straightening a bent knee, hip, or elbow joint, and the plan has been advocated and adopted by the majority of the English orthopædic authorities of late years to the exclusion, it may be feared injuriously—of all other methods of treatment.

The English public as well as the profession, had seen the very unsatisfactory condition of the treatment of lateral curvature of the spine by the *system of recumbency;* and the general advance in the construction of orthopædic instruments for the cure of club foot, &c., led gradually to the improvement of such portable contrivances for supporting the spine as had been previously employed by Tavernier and others.

The instruments now in use vary considerably in their principles of construction, as well as in the mechanical details; and the kind of apparatus to be applied in any particular case must depend upon the form and situation of the curve, and also upon the age of the patient.

There can be no doubt that the greatest advance which has taken place in modern times in the treatment of lateral curvature of the spine, has been made through the *system of mechanical treatment* by means of spinal instruments; but as might have been anticipated from the novelty and importance of the system, too much has been expected from it, and also too much claimed for it by its principal advocates.

Compared with other systems, there can be no question as to the superiority of the mechanical treatment, and if one plan alone were to be adopted, this would be most entitled to our confidence; but the evidence which I have laid before you of the constitutional, as well as the local causes which contribute to the production of spinal curvature; and the nature of the structural changes which occur even in slight cases of lateral curvature, must prevent our placing sole and implicit confidence in the power of any spinal instrument to cure the curvature.

I have no hesitation in stating, that it is impossible to straighten a curved spine by any mechanical means, in the same manner and upon the same principle as we can straighten a bent knee, ankle, or any other movable articulation; but in combination with other means, such as partial recumbency, and in some slight cases with muscular exercises, it is quite possible to cure a curvature of the spine when slight and of recent formation in young persons; and it is certainly within our power most effectually to arrest the progress of curvature when more severe.

LECTURE XI.

THE TREATMENT OF LATERAL CURVATURE OF THE SPINE CONCLUDED.

I NOW propose to describe in detail the treatment which will, I believe, be found most generally applicable to the various cases of lateral curvature of the spine included in the three classes or sub-divisions in which I have arranged the cases of this deformity, according to the relative degrees in which they can be traced to depend upon constitutional and local causes.

FIRST CLASS.

CASES ESSENTIALLY OF CONSTITUTIONAL ORIGIN, OR IN WHICH THE CONSTITUTIONAL LARGELY PREDOMINATE OVER THE LOCAL CAUSES.

In this class of cases the spinal curvature generally occurs under twelve years of age. Many cases occur in infancy or early childhood, *i.e.*, under three or four years of age; but the majority between seven and twelve years of age.

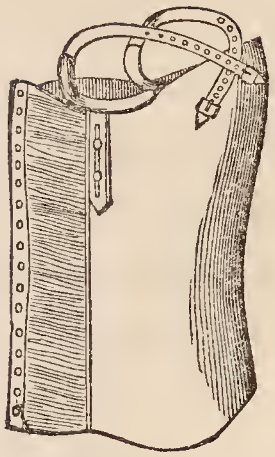
In those which occur in Infancy, the cause seems to be general muscular and constitutional debility; the children are too feeble to sit upright, even when a year and a-half or two years old. If these children be nursed in the sitting position, and more especially if habitually carried on one arm, a posterior curvature, or general yielding of the spine, is first noticed, and subsequently a lateral curvature often produced. Now, the question is—

What treatment is best adapted to these cases? I need hardly say that the constitutional treatment is of the first importance. As a general rule, these children have been badly suckled, the mother's milk being insufficient in quantity or poor in quality, or both; and farinaceous food has been substituted. But many of these children have from birth been extremely delicate and feeble—sometimes they are seven or eight months' children—or the condition of debility may have followed some early illness.

The most valuable remedy for improving the general health and strength in these cases is undoubtedly cod-liver oil, which I not only give internally, but order to be rubbed externally over the entire body and limbs, every night and morning after the bath; or for external application, salad oil may be substituted. An abundance of good milk must be given if the child can take it, and three grains of the hypophosphite of lime may be taken in milk twice a-day; sometimes also a tea-spoonful of wine in arrowroot once or twice a-day, and fluid animal food, such as veal broth, the gravy of meat, beef tea, jelly, &c. Solid meat is seldom well digested by these delicate children, and even when cut up very small is most improper for infants.

Then, with regard to *the local treatment,* the object of which must be either to prevent or cure a spinal curvature, the first point is, never to allow the child to be nursed in the sitting position. It must always be nursed and carried upon a pillow, or in a properly constructed nursing cradle, and the spine well supported by a strong leather spinal support, such as that which I now exhibit. (See Fig. 45).

FIG. 45.



Mr. Adams' Spinal Support for Infants.

Essentially, this support consists of a piece of thick leather, accurately moulded to the form of the back. A plaster of Paris cast is first taken of the back whilst the child is lying on its stomach on a table, so that, as nearly as possible, the natural form is thus represented; the leather, in a moistened state, is then placed on the cast and allowed to dry in the proper form. Elastic india-rubber material is attached to each side of the leather support, and passes in front across the chest, where it is fastened by lacing.

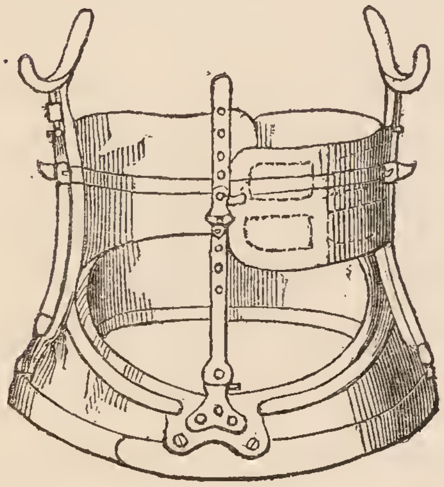
For children of about two years old or more, I generally add a light steel crutch on either side, to resist the inclination to fall forwards; but for infants a padded leather strap is sufficient to keep the shoulders back.

In a cheap form this kind of support may be imitated by a piece of gutta-percha moulded to the back, and kept bandaged on for ten minutes, whilst the child is made to lie flat on its stomach. It should then be lined with wash-leather, and retained in position by an ordinary bandage passing round the body.

The leather spinal support above represented, will require to be renewed every six months, in consequence of the growth of the child, and must generally be worn during the day-time for about two years, more or less. In the more severe cases I recommend that this support be worn during the night as well as the day, if the sleep be not interrupted by it.

In children from seven to twelve years of age, who are the subject of lateral curvature of the spine, I recommend the use of a light steel spinal instrument, with one or two lateral plates, according to the form and situation of the curvature. The form of instrument I employ in these cases is essentially the same as that invented by the late Mr. Eagland, of London; but the lever at the back is made to move by a single cog-wheel with lateral action, and the arm-pieces should rise rather higher in front. The lever at the back is connected with the crutches by a leather strap. (See Fig. 46.)

FIG. 46.



The Eagland Spinal Support, as improved by Mr. Adams.

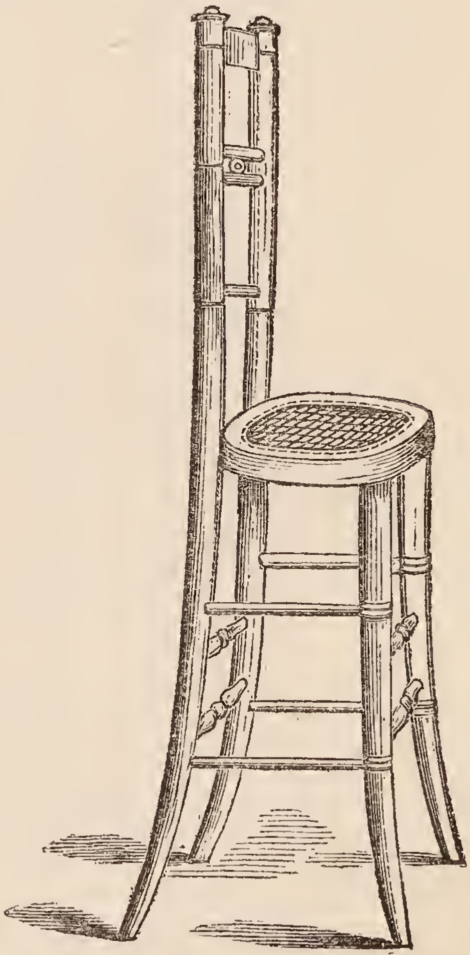
This form of apparatus may be made extremely light, and can be worn by any child without inconvenience. The small size of the hips in children renders it difficult to adapt any spinal instrument, but the form of the pelvic belt in the above apparatus is decidedly preferable to those of the other instruments in use. This instrument requires to be adjusted occasionally—that is, about once a fortnight, or once a month—by the surgeon; but, from the simplicity of the mechanism, any intelligent nurse can be taught to regulate it from day to day, when required.

I believe it to be quite unnecessary that this, or any other form of steel apparatus, should be worn at night, as recommended by some orthopædic authorities. No mechanical power can be advantageously employed by these instruments during the night, and the mechanical cause which leads to increase of the curvature—viz., the irregular distribution of the superincumbent weight—is effectually removed by the recumbent position. The freedom from restraint, also, is undoubtedly advantageous to the general health and muscular strength of the child.

In the treatment of these, as well as in all other cases of spinal curvature in young persons, the long continuance of the sitting and standing positions must be avoided as much as possible, and no position is so injurious, or more likely to produce spinal curvature, than sitting upright in a perpendicular backed chair, such as that delineated in Fig. 47.

This chair so well known as the Astley Cooper chair has been for many years extensively employed in educational establishments, under the idea that the position which young ladies are thus compelled to assume, would either prevent them contracting the habit of stooping, or overcome any such habit. The objections to the long continuance of the position enforced by this chair have been ably pointed out by Mr. Duffin,* who observes, "but these and equally valid objections to the use of the chair in question are usually met by the assurance that 'Sir Astley Cooper approved of it,' and he is, indeed, generally quoted as its inventor."

FIG. 47.



The Astley Cooper Chair, copied from Mr. Duffin's work on the Spine, p. 50.

The long continuance of the standing position, such as standing in classes at school, &c., is equally injurious.

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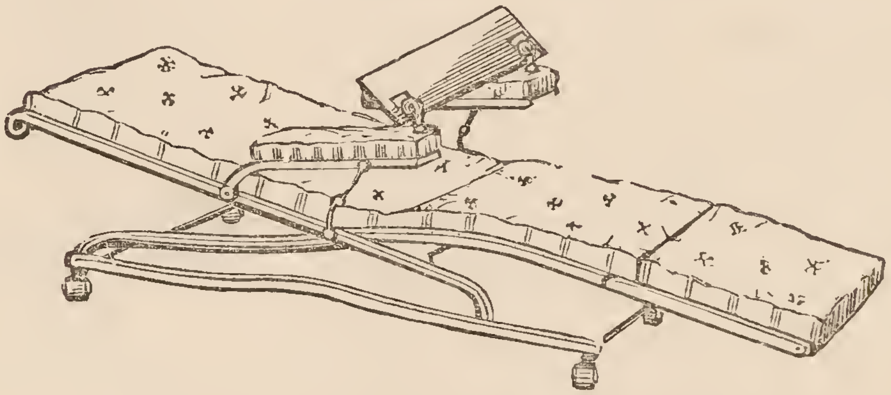
* "On Deformities of the Spine," by E. Duffin, M.D., London, 1848, page 51.

The fatigue induced causes the girl to vary her position by standing on one leg, which necessarily produces tilting of the pelvis; and in such a habit, the foundation of spinal curvature is frequently laid.

The long continuance of the sitting and standing positions are then especially to be avoided, and when the spine is weak and disposed to curve, or when curvature exists, the reclining position is that which should be enforced during, at least, one third of the day; and for this purpose I recommend the use of Ward's reclining chair as shown in Fig. 48.

FIG. 48.

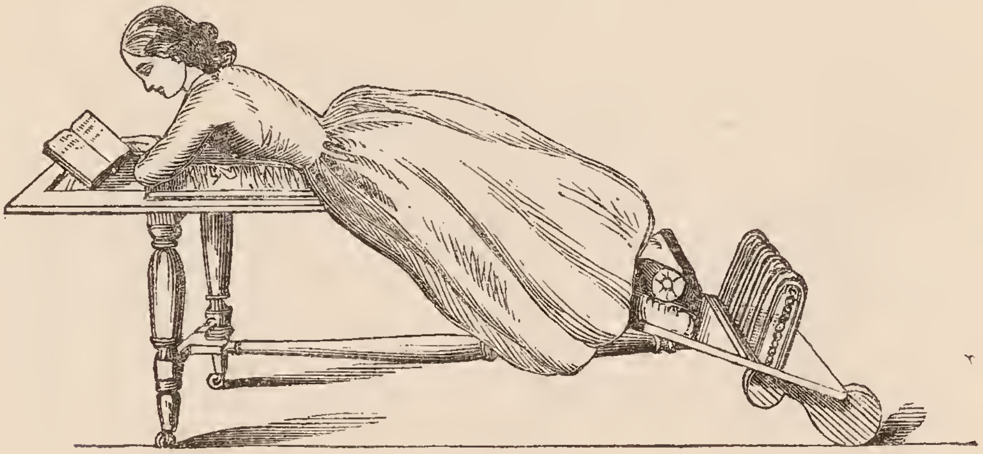


Ward's Reclining Chair adapted for Spinal Cases.

The inclination of this chair can be varied to any angle, from that of an upright chair to a horizontal couch, but the angle of 45° or more, as represented in the woodcut, is that best adapted to long-continued recumbency for spinal cases. In this position, the weight of the head and upper extremities is effectually removed from the spinal column, and the patient does not suffer any of the inconveniences, such as headache, indigestion, &c., so frequently attendant upon lying down on the *inclined plane,* or lying flat upon the floor which formerly used to be recommended. The addition of arms and a reading desk to the chair adds materially to the comfort of the patient, and allows education in its more important branches to proceed without interruption. This chair has been made for me for several years by Mr. Ward, of Leicester Square.

Partial recumbency, by which I mean reclining for about four or six hours a-day, is an essential part of the treatment in the cases we are now considering, and the use of the *prone-couch* represented in Fig. 49, may be recommended, as affording an agreeable change from the reclining chair, and facilitating some branches of study, such as drawing, music, &c. In this position, also, needlework may be more freely permitted.

FIG. 49.

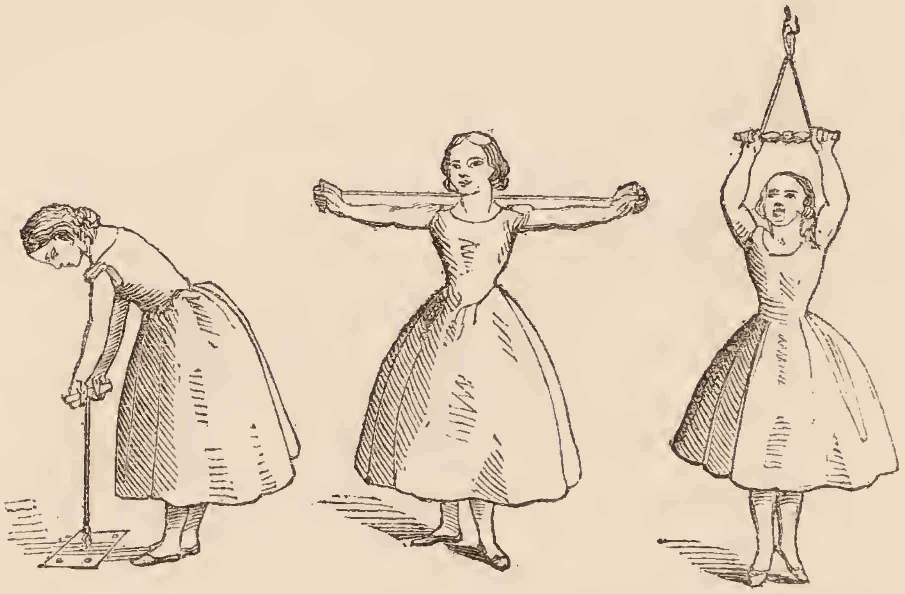


The Prone-couch.

Muscular exercises, or gymnastics, should also be combined with partial recumbency and mechanical support, in the treatment of the cases we are now considering, viz., those occurring in children between the ages of seven and twelve years. The gymnastic exercises form the most agreeable part of the treatment to the children, and may be chiefly relied upon in cases in which the curvature is brought under our notice quite at its commencement; but if the curvature should be more confirmed, then the additional use of a spinal instrument must not be dispensed with.

The gymnastic exercises upon which I believe we may chiefly rely for strengthening the spinal muscles, are those used by means of the *hand-swing, the elastic chest-expander, and in the act of drawing up a weight from the ground* ; the latter may be imitated by a short and strong cord of vulcanised india-rubber attached to the ground—this is the movement of the *top-sawyer* at the saw-pit. (See Fig. 50). These exercises, and any others which may be thought advisable, should be systematically gone through by the patient twice a-day for half-an-hour each time, or a shorter period if fatigue be induced. Friction to the back and body generally, and the use of the cold-bath, when the latter can be borne, is also useful.

FIG 50.

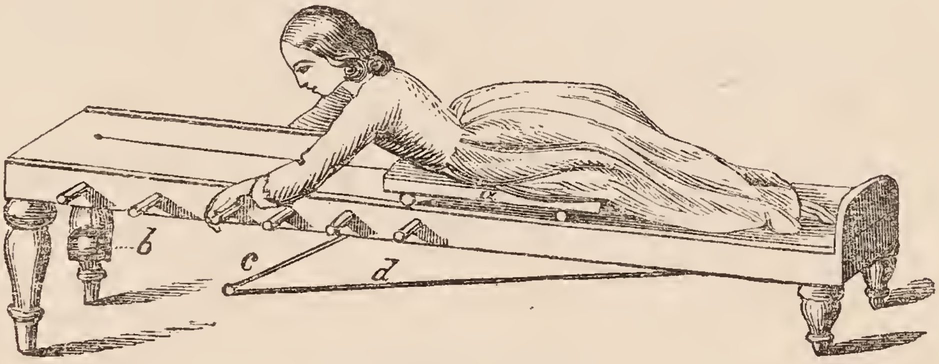


Gymnastic exercises most useful in slight cases of lateral curvature.

When the curvature is situated chiefly in the lumbar region, and exhibits a decided disposition to increase, the fear of which may be added to by the knowledge of an hereditary tendency to spinal curvature existing in the family, I recommend more strict attention to recumbency, and also advise the use of gymnastics in the horizontal position by means of an *exercising-plane*. These exercising planes have been variously constructed by Mr. Amesbury, Mr. Coste, &c., but so far as I know, the idea was originally suggested and the plan ingeniously carried out by Mr. John Shaw,* whose treatise 'On Lateral Curvature' may, undoubtedly, be regarded as the best and most scientific which has ever appeared in the English language.

The exercising-plane I employ, provides a variety of exercises both for the arms and legs, and includes some special contrivances by which the spinal muscles may be brought into play. (See Fig. 51). The body of the child when lying down on this plane rests upon a flat, but softly cushioned, board or stage *a*, which is made to travel up and down the length of the plane in grooves, and regulated by weight *b*, as well as by the lever *c*, from which the cord *d* passes to the lower end of the plane, through a pulley to be connected with the double stage. Wooden handles are attached along the sides of the plane at short distances ; and by grasping these alternately, the child can draw up her body along the plane, and the weight of the body to be moved, can, if desirable, be increased by weights attached to the travelling stage.

FIG. 51.



Exercising Plane.

Then, for the exercise of the legs, strong vulcanised india-rubber bands are fastened to a bar attached to the lower end of the plane, and the feet placed in shoes connected with these bands. Upon this principle a variety of exercises for the legs may be contrived, and by a similar arrangement at the upper end of the plane—a band fastened round the head, and connected with an india-rubber cord—the patient may exercise the spinal muscles by drawing the head and the upper part of the body in a direction backwards and upwards, the resistance of course being the elastic force of the india-rubber band.

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* "Observations on the Lateral or Serpentine Curvature of the Spine," &c., by Mr. J. Shaw. 1825.

I here introduce a diagram, Fig. 52, of the exercising plane suggested by Mr. John Shaw, and copied from his work, page 236, above referred to. Mr. Shaw thus describes the diagram :—

FIG. 52.

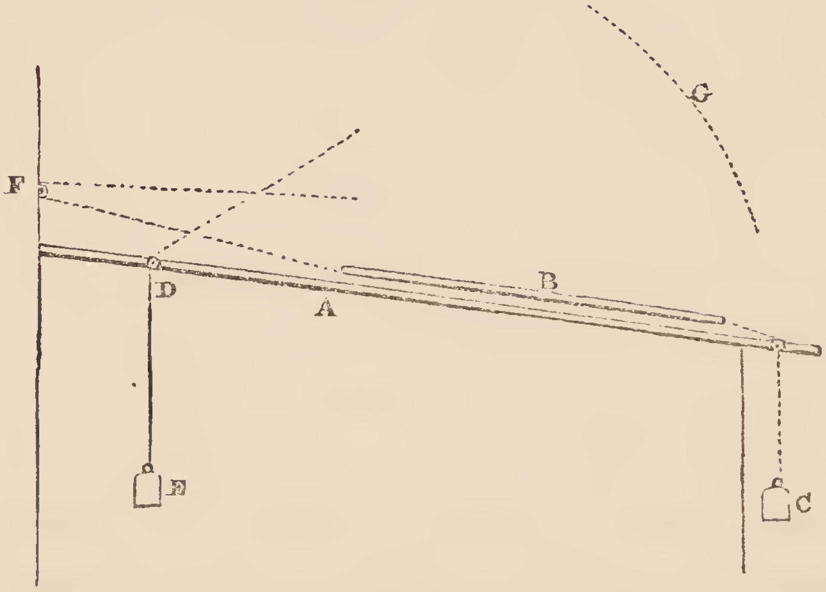

Diagram of Mr. J. Shaw's Exercising Plane.

" Upon the plane A, which is considerably elevated, there is a movable board B. If the patient sits upon this, and pulls upon a piece of wood attached to a cord, which, after running through a pulley F, is fixed to the board B, she will draw up the board ; and if the arms be at the same time kept at full length, the body must fall back in the direction of the dotted line G, thus acting upon the vertebræ of the loins. The power required to raise the board, will depend upon the degree of the elevation of the plane, and on the weight C.

"This exercise is very good for the curve in the loins, but it produces little effect on that in the upper part of the spine. This, however, is easily effected by putting in a pulley at D, and raising the weight E with the band round the head."

Gymnastic exercises systematically conducted whilst the patient is *in the horizontal position*, possess the great advantage of strengthening the muscles and improving the general health, at the same time that the mechanical conditions which tend to increase the curvature—and which are inseparably connected with the erect position—are completely removed. I know of no plan by which this can be so well carried out as by the use of the exercising-plane I have recommended. There can be no doubt of the great advantage of combining gymnastic exercises with the recumbent position in the treatment of lateral curvature of the spine in the lumbar region, especially when this occurs in young children, *i.e.*, between the ages of seven and twelve years, as in the class of cases we are now considering.

The same principle of treatment is, no doubt, equally desirable in similar cases of spinal curvature occurring at a later period, *i.e.*, generally between the ages of twelve and sixteen, as in the class we shall next consider; but from the practical difficulties thrown in the way, especially connected with education, and the indulgences given to girls at this age, it cannot be so well followed out. I know one lady, now the mother of several children, who when young was subjected to this treatment for seven years, and passed five hours a-day on the exercising-plane. She is now perfectly straight and a good figure; but a similar tendency to spinal curvature is exhibiting itself in her daughters, who are being treated partly on a similar plan, but gymnastics in the erect position are also employed.

Too much importance cannot be attached to the treatment of spinal curvature when it occurs in children between the ages of seven and twelve years, because it is from this class that the very worst cases of spinal deformity are produced. An hereditary predisposition is generally traceable, and the deformity often increases rapidly. These cases are frequently, but, I believe, erroneously considered to depend upon rickets. The spine alone is affected, and there are no general indications of rickets, such as curvature of the leg-bones, or other bones of the skeleton ; no enlargement of epiphyses, no pelvic deformity, or rachitic conformation of the skull. The growth is not stunted as in rickets ; and girls thus affected often grow rapidly, and frequently attain more than the ordinary height.

Constitutionally, the general aspect of these children is decidedly strumous, and cases of phthisis may frequently be traced in their family history. There can be no doubt, therefore, that the constitutional causes largely predominate in the production of the spinal curvature in these cases : hence the necessity for constitutional treatment, such as the exhibition of preparations of lime, iron, cod-liver oil, &c., and of great attention to the digestive and assimilative functions, aided by suitable residence either at the sea-side, or on elevated situations on chalk soil, &c.

These cases must be regarded essentially as the worst and most unpromising that we meet with in practice, partly on account of their own inherent tendency to increase in severity ; and partly, I may say principally, on account of the difficulty met with in practice of continuing the treatment long enough either to avert the threatened mischief, or even to cure such curvature as may have already formed.

It is impossible to say what length of time may be required for this purpose, but certainly in many cases, treatment will require to be systematically carried out during a period of seven or ten years. In the more favourable cases three or four years may be sufficient, but much good can seldom be effected under this time.

In one case belonging to this class, the young lady first came under my treatment seven years ago, she being then ten years of age, and the curvature very slight but confirmed; there was no appearance of rickets, but she had unquestionably a strumous aspect, and a strongly marked hereditary tendency to spinal curvature existed. Her eldest sister was frightfully deformed by a severe lateral curvature, and four of her cousins also suffered from lateral curvature. Three ladies, sisters, had each large families, and in each family there were two cases of lateral curvature.

In the case of the young lady under my care, it was a matter of great anxiety to prevent the spinal curvature becoming severe, and if possible to cure what had taken place. I at once applied a light mechanical support, and combined gymnastics and partial recumbency. The progress was most satisfactory, and at the end of four years scarcely a trace of spinal curvature existed; no deviation in the spinous processes, and only a very slight posterior projection of the angles of the ribs on one side remained, and even this required a careful anatomical examination and comparison of the two sides to detect. The general health was good, although the girl had always a delicate appearance. At this period I recommended that the mechanical support should be gradually discontinued, and gymnastics relied upon together with partial recumbency.

I then lost sight of the case for about two years, when she was again brought to me, and a decided increase of curvature had taken place, with some lateral deviation of the spinous processes. The spinal instrument was now re-applied, and she will continue to wear it for some years, probably till she has completed her growth; and even then, perhaps, a slight curvature may remain through life, but there will be no obvious external deformity. During the last four years this young lady has grown rapidly, and is now about five feet five inches in height. It is certain that in this case the mechanical support ought to have been continued through the whole period of active growth, and I mention it here to show the necessity for such prolonged treatment in this class of cases.

Next let us consider the treatment necessary in the cases which I have arranged in the second class.

SECOND CLASS.

CASES DEPENDING UPON CONSTITUTIONAL AND LOCAL CAUSES IN ABOUT EQUAL DEGREES.

In this class of cases the spinal curvature generally occurs between the ages of twelve and sixteen years. Hereditary tendency is not usually traceable, but exists probably in about one fourth of the cases included in this class. Muscular debility in quickly growing girls is generally considered to be the cause of the spinal curvature in these cases, and undoubtedly in many instances muscular debility does exist, and must be regarded as the predisposing cause.

These are the cases in which girls are commonly said to have *outgrown their strength*; and we see *weak spines* gradually passing into and becoming cases of *confirmed lateral curvature.* Co-existing with these conditions, however, we may also trace, in most instances, as the direct producing cause of the spinal curvature, some local cause acting mechanically so as to disturb the equilibrium of the spinal column; such as standing upon one leg, sitting cross-legged, excessive horse-exercise, and other causes already enumerated, and in the poorer classes frequently connected with certain occupations which render the long continuance of some particular position necessary.

THE TREATMENT of the cases included in this class must be, therefore, in most instances, both constitutional and local. Every effort must be made to strengthen and improve the general health of the patient, where this is impaired from any cause, and for this purpose the exhibition of cod-liver oil, iron and lime, as previously mentioned, together with nutritious diet with wine or beer, amounting, in fact, to what is called *high living*, where this can be borne; change of air either to the country or the sea-side, and other means, will generally be advisable; but *local treatment*, having direct reference to the spinal curvature, is at least of equal importance with the constitutional treatment.

With this view, I believe these cases require to be treated by *partial recumbency, gymnastic exercises* and *mechanical support* combined in various proportions, according to the severity and the situation of the curvature, and the general condition of the patient as to muscular debility or otherwise.

Exact rules as to the combination of these different methods of treatment can hardly be laid down, so various are the conditions presented by these cases; but, speaking generally, I recommend the *recumbent position* in the reclining chair, represented in Fig. 48, in proportion as the spinal curvature predominates in the lumbar region.

In this region the curvature is less amenable either to mechanical or gymnastic treatment; and the structural changes in the intervertebral cartilages and oblique articulating processes existing in all cases can only be arrested, and the damage repaired, by the reparative powers of nature during the period of active growth in the recumbent position. All the mechanical conditions tending either to the production or increase of the spinal curvature are thus effectually removed; and I know of no means by which this can be accomplished except by the recumbent position.

Theoretically, therefore, complete recumbency, by which I mean lying down for a period of from one to two or three years, would be the best treatment; and practically, no doubt, it has often been found to answer exceedingly well in slight cases. The advocates of such a system will doubtless be able to point to numerous cases in which the treatment has been perfectly successful; but all practitioners know that by many patients complete recumbency for a lengthened period cannot be borne, and that under its influence the general health gives way.

A compromise must therefore be made, and there can be no doubt that, with the assistance of the improved spinal instruments now in use, the patient may be allowed to take a fair amount of walking exercise, whilst the spine is so effectually supported that the unequal distribution of the superincumbent weight—the direct cause of the increase of the curvature—is to a great extent prevented; and education, as well as the ordinary pleasures of life, will be much less interfered with. Writing, drawing, and music must, however, be diminished in the education of young ladies under treatment for spinal curvature, as the long continuance, either of the sitting or standing positions, is that which we have more especially to avoid.

The directions I usually give with respect to these accomplishments are, that all music and drawing lessons be limited to half an hour, but a young lady may practice at the piano for half an hour at a time, several times a day; and dancing lessons to be limited to an hour. Walking, or out-door exercise should never exceed an hour at a time.

If, as a general rule, the sitting position be not maintained for more than half an hour at a time, and the erect position for more than an hour, with intervals of reclining of not less than half an hour or an hour, I should consider the system of partial recumbency carried out to an extent sufficient for all practical purposes in the treatment of lateral curvature.

With regard to the combination of *gymnastics* with *partial recumbency* and *mechanical support* in the treatment of these cases, in which the spinal curvature predominates in the lumbar region, I believe the gymnastics should be conducted as much as possible whilst the patient is in the horizontal position, and this can be accomplished by the use of the exercising-plane which I have already described. The patient may use this exercising-plane for a quarter or half an hour three times a-day; it is also frequently employed as a reclining board, so that a double object is thus effected.

Then, with regard to *gymnastic exercises, as a general principle of treatment* in the class of cases we are now considering, viz.: those which occur in growing girls between the ages of twelve and sixteen years, I recommend their adoption, in proportion to the evidence of general muscular debility, in the cases which I have described as *weak spines*, or weak spines passing into the condition of confirmed curvature; and when the spine is disposed to curve in the dorsal and upper lumbar regions, and assume the form of a long single curve. If these cases are submitted to treatment at a sufficiently early period, gymnastics may be chiefly, if not entirely, relied upon; but, as I regard gymnastics as a preventive rather than a curative method of treatment, I always combine them with partial recumbency, *i.e.*, lying down in the reclining-chair four or six hours a-day, which I consider to be a direct curative means.

In addition to the gymnastic exercises already described, a great variety of such means have been devised by various authors who have paid special attention to the subject of spinal curvature, and amongst them the following will, I believe, be found to be most generally useful; and first I would allude to that invented by Mr. Stafford, and described by him as "the lateral rocker," see Fig. 53.

Mr. Stafford observes, "For the purpose of performing this exercise I have invented a machine which consists of a semi-circle, made of wood, and which rests upon the ground, being not unlike a rocking-horse. At the upper part, and at each end of this machine, a rope is attached, which passes over two pullies, fixed at certain distances in the ceiling. The patient stands upon this machine, taking hold of the rope by each hand, and thus rocks herself backwards and forwards, by which both the lumbar and dorsal curve are acted upon laterally."*

Mr. Stafford recommended this exercise in the belief that lateral curvature was capable of being cured by lateral exercise. "When the distortion has become confirmed, when both the primary and secondary curve have taken place, when we can both see and trace with our fingers the serpentine course of the spinous points in the back, and directed that the patient should use every effort to act upon both the primary and secondary curve."

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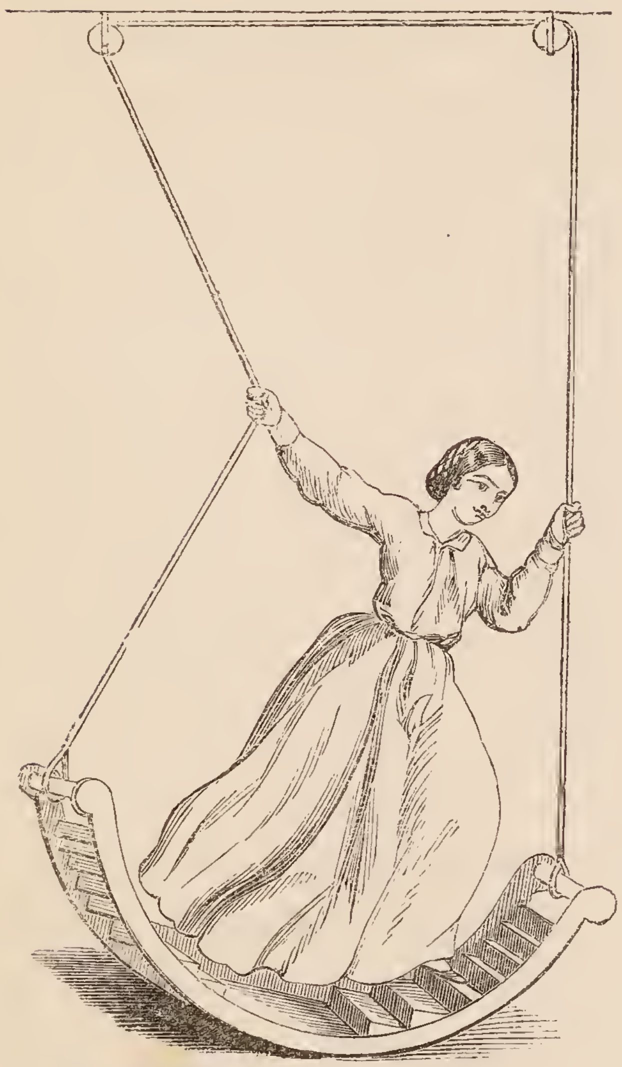
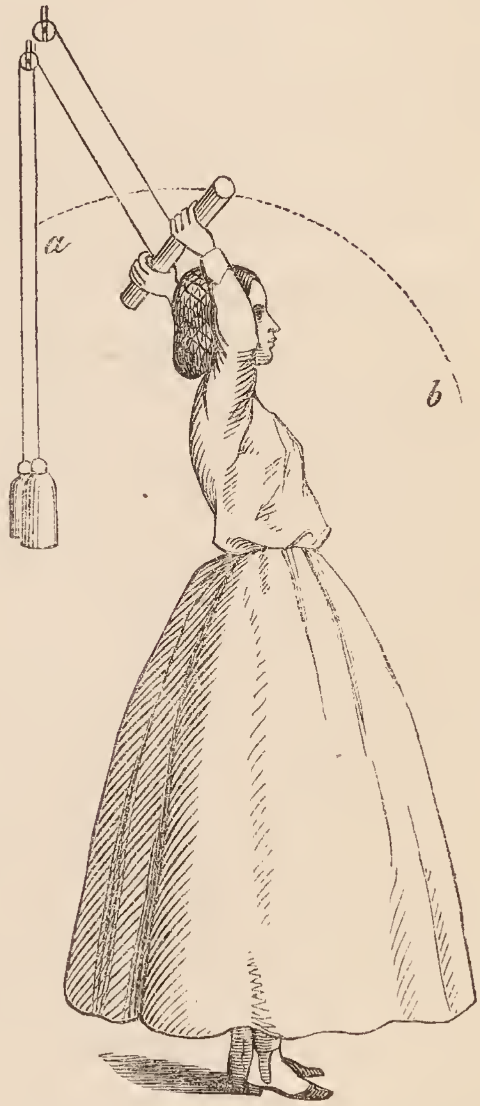
* *Op. cit.*, page 70.

FIG. 53.



Mr. Stafford's "Lateral Rocker."

FIG. 54.



Exercise recommended by Mr. Lonsdale

Whilst I do not agree, however, in the theory adverted to, and the curability of confirmed double lateral curvature by any such means, I consider the apparatus well calculated to exercise and strengthen the muscles of the spine; and therefore recommend its adoption in the class of cases we are now considering, rather as preventive than curative, although useful in cases of slight curvature, combined with other means.

My late colleague, Mr. Lonsdale,* held the same opinion as myself with regard to gymnastics being a preventive, rather than a curative means, and advised their adoption either in cases of weak spine, very slight curvature, or in those cases in which "the spine has been brought by mechanical treatment nearly, if not quite, into the erect position."

In such cases his object was to strengthen those muscles "whose office it is to keep the spine erect," and especially recommended the form of exercise exhibited in Fig. 54.

Mr. Lonsdale observes,† "The wood-cut shows the position of the patient with the arms extended above and behind the head, the pullies being placed some way behind also, to ensure the most effectual action of the muscles when they draw the weights upwards, by moving the arms in the line A B, without bending the spine; the motion of the body being produced by the pelvis on the thigh bones.

"By this plan, all the muscles of the back are put into action in the most effectual manner, including those proper to the spine itself and those connected with the ribs."

In Fig. 55, I have given a representation of a complete gymnasium, by means of which the greatest variety of exercises can be performed, imitating every natural movement, and by its use capable of strengthening as far as possible, any set of muscles. A number of weights are contained in the box, and to these the ropes which pass out through pullies, are connected. This apparatus is figured in Mr. Verral's work "On the Spine,"‡ and is stated to have been invented by Mr. Whiting.

Instead of employing the weights and pullies as represented in the above figures, various contrivances essentially consisting of vulcanized india-rubber cords, which

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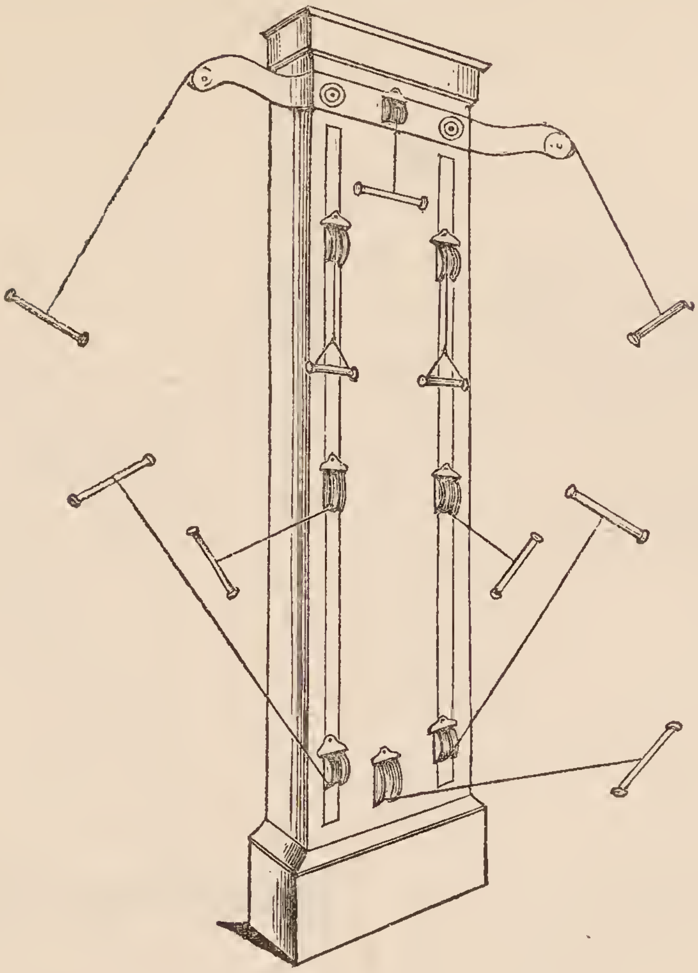
* *Op. cit.*, page 116.

† *Op. cit.*, page 122.

‡ "On the Spine," by Charles Verral, 1851, page 70.

FIG. 55.

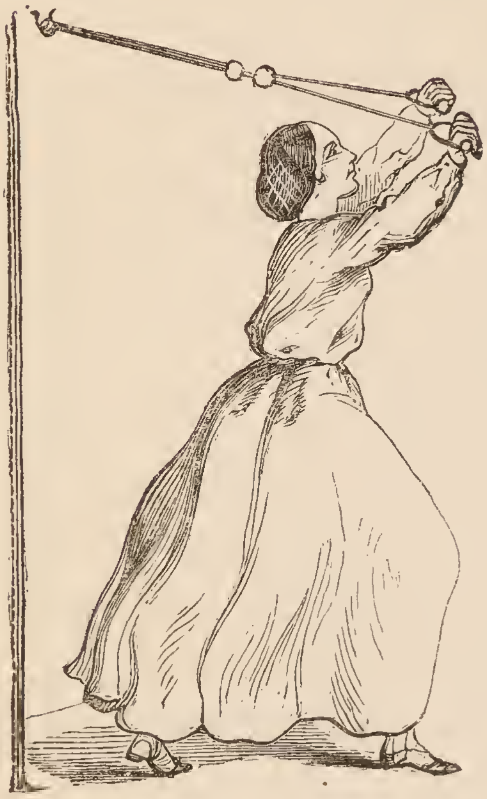


Gymnasium for a variety of exercises.

can be attached to hooks fixed in the wall, have recently been invented, and by which every kind of exercise may be performed. Some of these have already been presented in Fig. 50, but others are exhibited in the annexed Figs. 56 and 57.

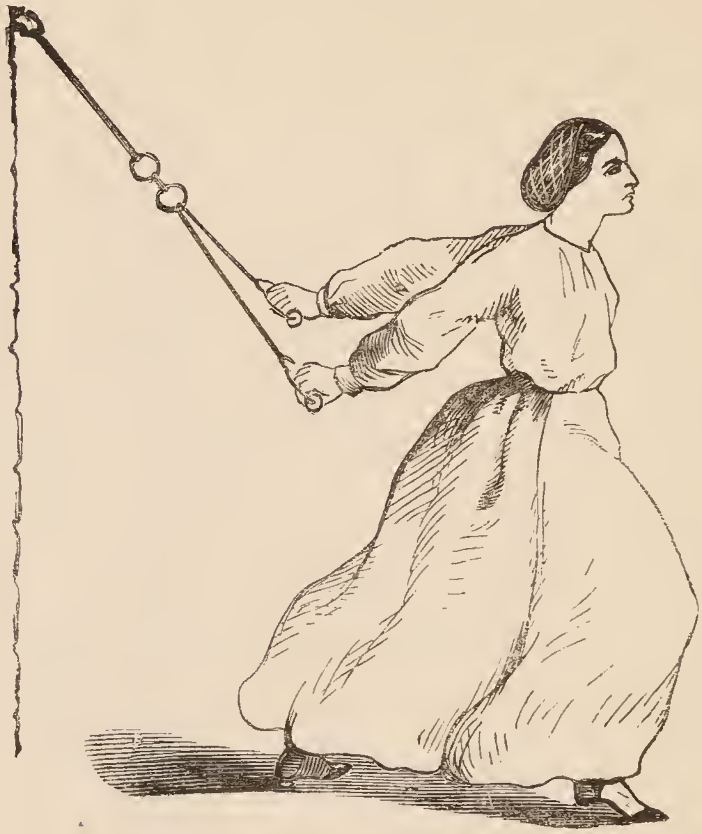
If the case instead of being one of *weak spine,* or weak spine passing into confirmed curvature, be one of *confirmed curvature,* the proof of this will consist in the existence of some of the anatomical deviations which I have already described—such as the posterior projection of the angles of the ribs on one side in the dorsal region, or of the transverse processes in the lumbar region, with a corresponding depression of the ribs or transverse processes on the other side, with or without lateral deviation of the apices of the spinous precesses. In such cases, I believe we may safely rely upon these evidences of structural deviations, as indications for the commencement of mechanical treatment, and then we must combine with the means just described *mechanical support by means of a spinal instrument.*

FIG. 56.



Exercise with vulcanized India rubber cords.

FIG. 57.



Exercise with vulcanized India rubber cords.

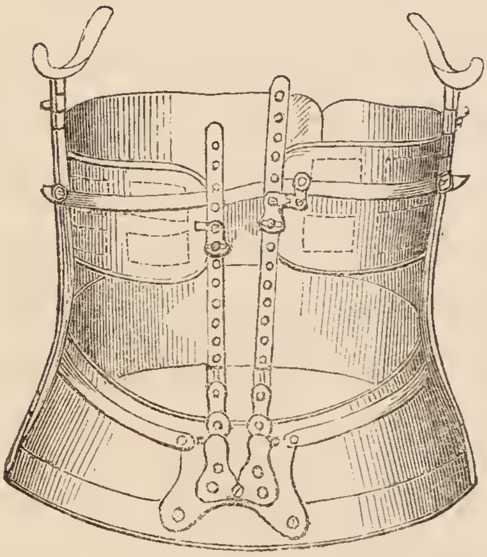
Mechanical treatment, to be effectual, must be carried out by means of spinal instruments capable of giving a firm support to the spine, as well as exerting a certain amount of active force or pressure. This can be regulated from time to time by the surgeon, and applied with more or less accuracy to the portion of the spinal column which is the precise seat of the curvature. The extent to which we can rely upon *mechanical treatment* as curative, must vary very much in different cases, and depend upon the situation, form, and extent of the curvature, as well as the length of time it has existed. Speaking generally, mechanical treatment may be most certainly relied upon when the curvature predominates either in the middle, or in the middle and lower portions of the dorsal region, as in these situations we can most directly act upon the spinal column through the medium of the ribs.

In the observations on the Physiology of the spinal column in relation to the production of lateral curvature, contained in the second lecture, I have endeavoured to prove that lateral curvature of the spine cannot be cured by mechanical treatment alone, mainly because there is no anatomical analogy between the articulations of the vertebræ, and the movable articulations of the extremities. Between the vertebræ we have no articular cartilage admitting of free surface-play, and the vertebral articulations admit only of an extremely limited amount of motion in certain directions; thus, they hold an intermediate position between the movable and immovable articulations of the body. It is not possible, therefore; to straighten a spinal curvature in the same way, and upon the same principles of direct mechanical pressure, or extension, as we employ with so much success in the contractions of the knee, hip, elbow, and other movable articulations of the extremities.

Nevertheless, there can be no doubt, that of all the various *systems* employed for the cure of lateral curvature, the relative merits of which have been already discussed, if any one *system* is to be exclusively depended upon, more good will be done by the *mechanical system of treatment* than by any other ; and in the more severe cases this alone must be relied upon for giving such relief as the cases admit of. But in all the slighter cases in youth, a judicious combination of mechanical support, with gymnastics, and lying down, according to the situation, form, and severity of the curvature, is the only scientific treatment to be relied upon in practice, for curing such forms of curvature as are capable of being cured.

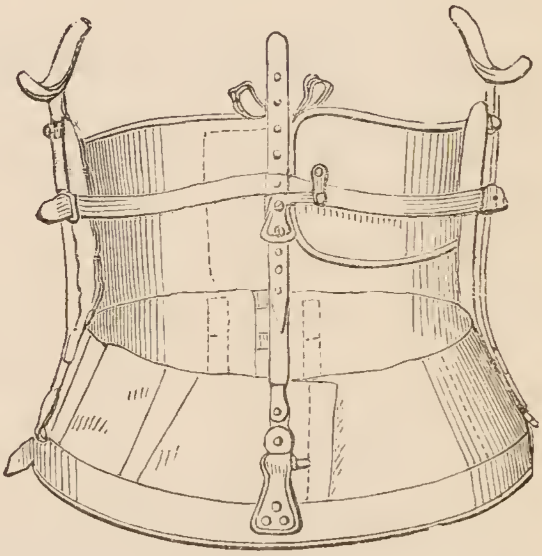
A great variety of spinal instruments, constructed upon very different principles, have been and are still employed by various authorities on spinal curvature; but those which I have found most efficient in the cases we are now considering are of two forms, viz.:—one, a modification of the Eagland spinal support, adapted for slight cases in young and delicate girls (see Fig. 58); and the other, a much stronger instrument, with more complicated mechanism, used in the more severe cases, and for stronger girls above fourteen years of age. (See Figs. 59 and 61).

FIG. 58.



A modification of the Eagland Spinal Instrument, with the addition of Rotation-plate for the dorsal curve.

FIG. 59.



Mr. Adams' Rotation-plate Instrument, with single plate for dorsal curve.

The light instrument, which is a modification of the Eagland spinal support, is represented in Fig. 58. The pelvic belt is strengthened by being made to clasp in front, and the arm-pieces attached to the crutches are raised in front to resist the posterior pressure. One or two steel-plates are attached to separate levers which move by cog wheels connected with the pelvic belt in lateral, and antero-posterior directions, and these levers are also connected with the crutches by means of a transverse leather strap.

The stronger instrument, which I always speak of as my *rotation-plate instrument,* is represented in modified forms with single and double plates in Figs. 59 and 61. This instrument I have constantly used since the year 1854, when it was first made at my suggestion, for the case represented in Fig. 34, but it has been since much improved in mechanism and lightness by Mr. Blaise, of St. James' Street, by whom, also, the other instruments represented are made. The pelvic belt is of a circular form, and made of strong flat steel; the crutches are proportionably stout, and move in an antero-posterior direction by cog-wheels connected with the pelvic belt; these, however, are only required in cases of extreme deformity. One or two lateral steel plates are attached to separate levers, the dorsal plate being made to move in several directions for the purpose of accurate adaptation, and having a cog-wheel, by means of which it can be moved in the direction of horizontal rotation.

The action of this rotation-plate I have endeavoured to

FIG. 60.

FIG. 1. FIG. 2.

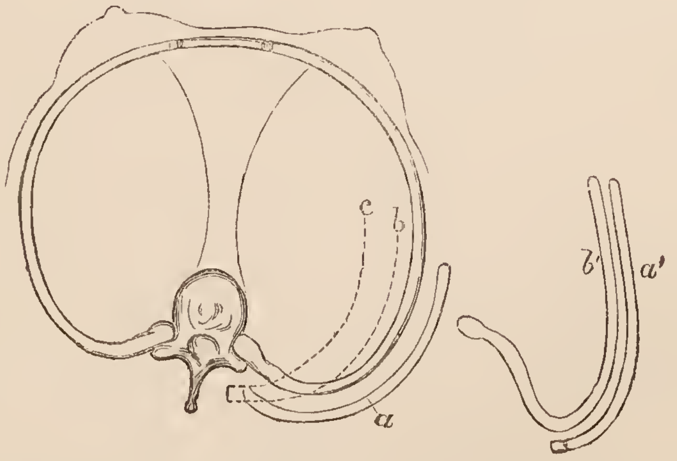


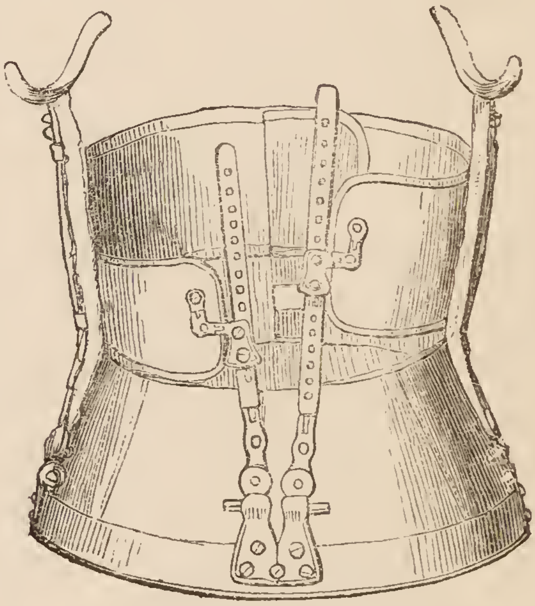
Diagram representing the action of Mr. Adams' Rotation-plate Instrument, as compared with the plates generally in use acting by direct lateral pressure. Fig. 1, Section of Chest, *a,* rotation plate moving in direction of the lines *b c.* Fig. 2, *a,* plate acting by direct lateral pressure, and producing a flattening of the ribs *b.*

illustrate by the diagram in Fig. 60, as compared with the plates generally in use, acting by direct lateral pressure.

By this diagram, it will be seen that the mechanical force employed by the rotation cog-wheel is directed against the ribs in the same plane, but in the opposite direction to that in which they have deviated from their normal position, in consequence of the rotation-movement of the bodies of the vertebræ.

This rotation, I believe, always takes place in cases of confirmed lateral curvature, and has been described by me as forming "*the internal curvature*," as distinguished from "*the external curvature*," or lateral deviation of the apices of the spinous processes. The lumbar plate shown in Fig. 61, does not generally require the same mechanism, as the force exerted by it cannot usefully be directed against the lower curve; but when this curvature involves the lower dorsal vertebræ, it may be added, as represented. The levers are movable in the antero-posterior, as well as in the lateral direction, by two cog-wheels connected with the pelvic belt, and they are also connected with the crutches by means of leather straps, omitted in the woodcut.

FIG. 61.



Mr. Adams' Rotation-plate Instrument. with dorsal and lumbar plates.

This instrument requires careful and frequent adjustment by the surgeon, who should regulate the pressure employed once or twice a week. As a general rule, I do not recommend the instrument to be worn at night, though in some cases, accompanied with more than ordinary spinal pain, advantage is occasionally derived from so doing.

The cases included in the class we are now considering, viz.—those which generally occur in growing girls between the ages of twelve and sixteen, and depend upon constitutional and local causes in about equal degrees —are generally the most curable we meet with in practice.

I have no hesitation in expressing my conviction that if these cases be submitted to treatment before any very obvious external deformity has occurred, they are generally curable within one or two years In some instances, especially if an hereditary tendency to spinal curvature exists, and the girl is of a feeble constitutional power, a longer period may be required; whilst in the more advanced stages, the curvature can certainly be arrested and diminished by treatment continued over four or five years, but in some instances it is necessary that the spinal instrument should be worn till the growth of the patient is complete, and the general health and strength sufficiently established to remove all fear of increase of the spinal curvature.

Finally, with regard to the treatment best adapted to the cases which I have arranged in the third class.

THIRD CLASS.

CASES ESSENTIALLY DEPENDING UPON LOCAL CAUSES, ACTING MECHANICALLY SO AS TO DISTURB THE EQUILIBRIUM OF THE SPINAL COLUMN.

Lateral curvature in these cases may occur at any period of life, though most apt to form in a severe degree previous to the completion of growth. These cases are essentially unconnected with any constitutional or hereditary predisposition, and frequently co-exist with the full natural amount of muscular strength.

The local causes which directly produce spinal curvature in these cases, may be the same as those already enumerated as contributing to the production of curvature in conjunction with constitutional causes, in the cases arranged in the second class; more especially the long continuance of some bad position acquired as a mere habit, or rendered necessary by some occupation. More frequently, however, the local cause depends upon inequality in the length of the legs, sometimes arising from congenital defects, such as congenital dislocation of one hip-joint, &c., or from contraction of the hip or knee-joint following disease, and a variety of other affections, already enumerated in the classification of cases.

Boys are much more liable to spinal curvature arising from these local causes than from the constitutional causes enumerated in the other classes described.

The treatment of the spinal curvature in the class of cases we are considering, must be essentially local; acquired bad habits must be discontinued; occupations which tend to produce the curvature must be given up; and inequality in the length of the legs compensated for by raising the boot on the shortened leg. In most cases the use of a spinal instrument may be recommended during the period of growth either with the view of curing the curvature when it arises from removable causes, or of preventing its increase when the curvature has advanced to an incurable degree, and the cause producing it is incapable of removal.

The long continuance of the sitting and standing positions must be avoided; and also, during growth it is necessary to combine with these measures, partial recumbency, *i.e.*, the use of the reclining chair for some hours a-day, during the time devoted to educational pursuits.

By a judicious combination of these means we shall thus be enabled to limit the extent of the mischief which it is beyond the power of human skill to remove.

THE END.

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